

SEARCHING FOR BSM SOLAR NEUTRINO INTERACTIONS USING DIRECTIONAL DETECTORS

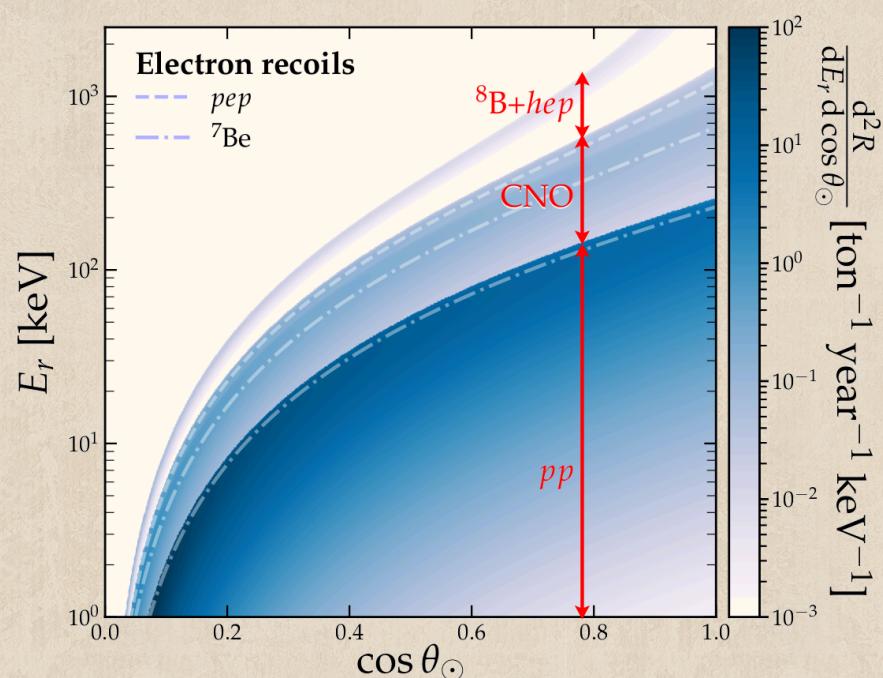


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Aim

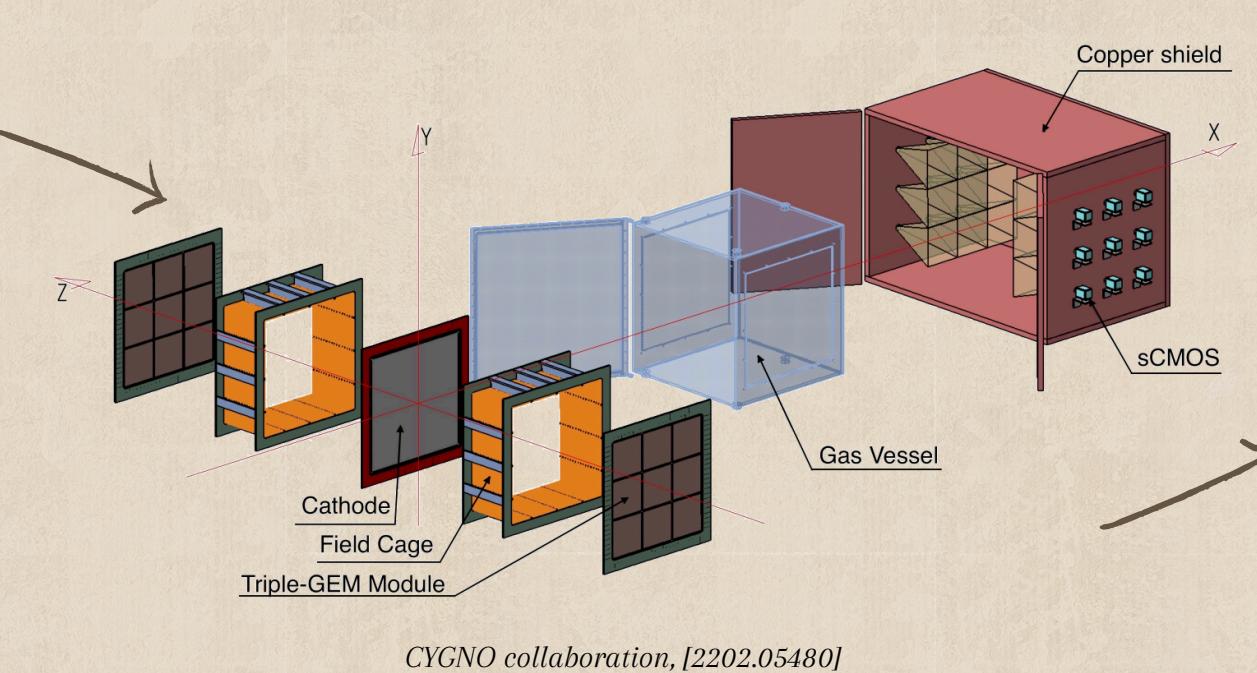
Highly-segmented micro-pattern gas detectors (**MPGDs**) can measure both *direction and energy* of ionisation tracks from recoil events. This directional sensitivity grants them better signal information and background rejection, meaning they can **reconstruct the solar neutrino flux** and study **beyond-SM physics manifesting in -keV neutrino-electron recoils**. Forecasted results for a future small-scale experiment of this kind show its sensitivity to **NSI parameters** would approach Borexino's leading results.

Each recoil track's energy and scattering angle can be kinematically traced back to the neutrino's initial energy

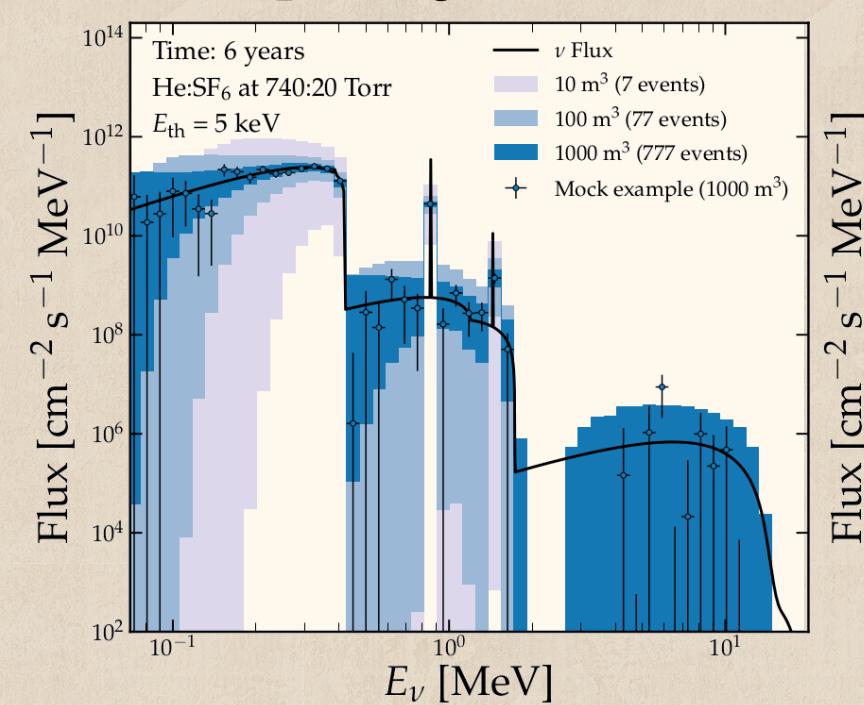


From Standard Model...

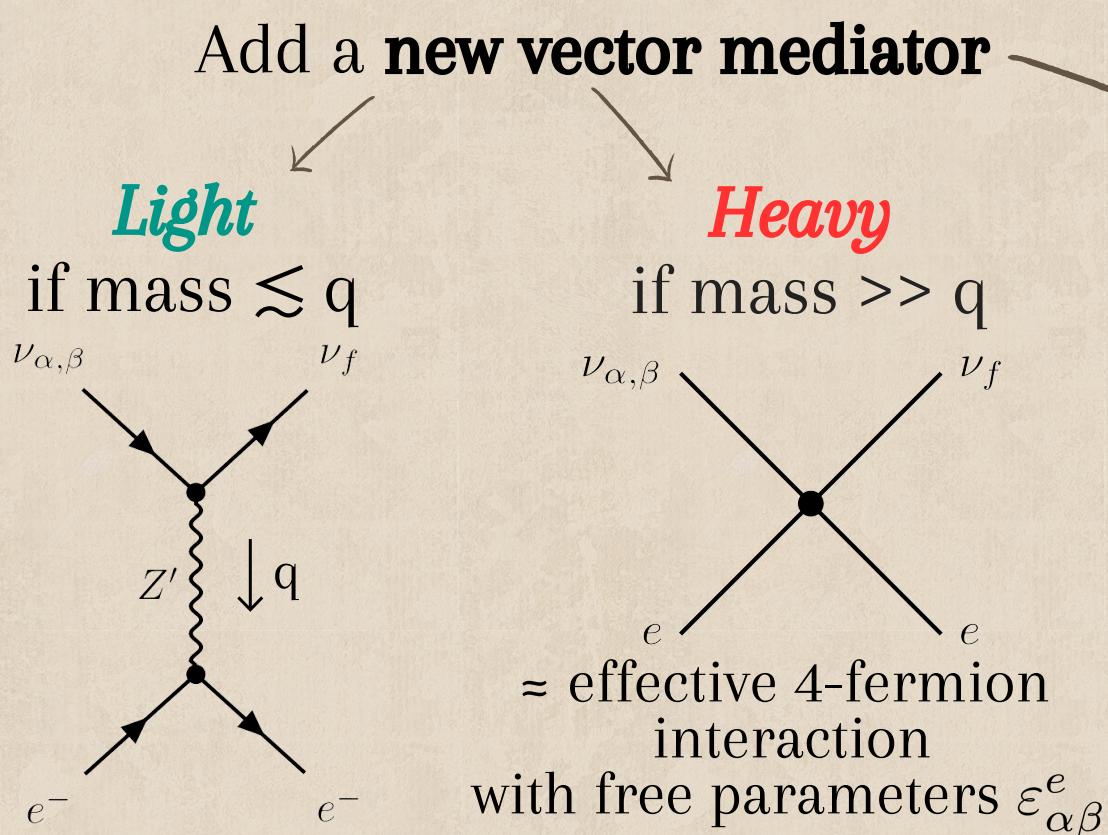
This means that with a detector sensitive to direction...



...we **can reconstruct the solar neutrino spectrum event-by-event**, and separate competing sources!



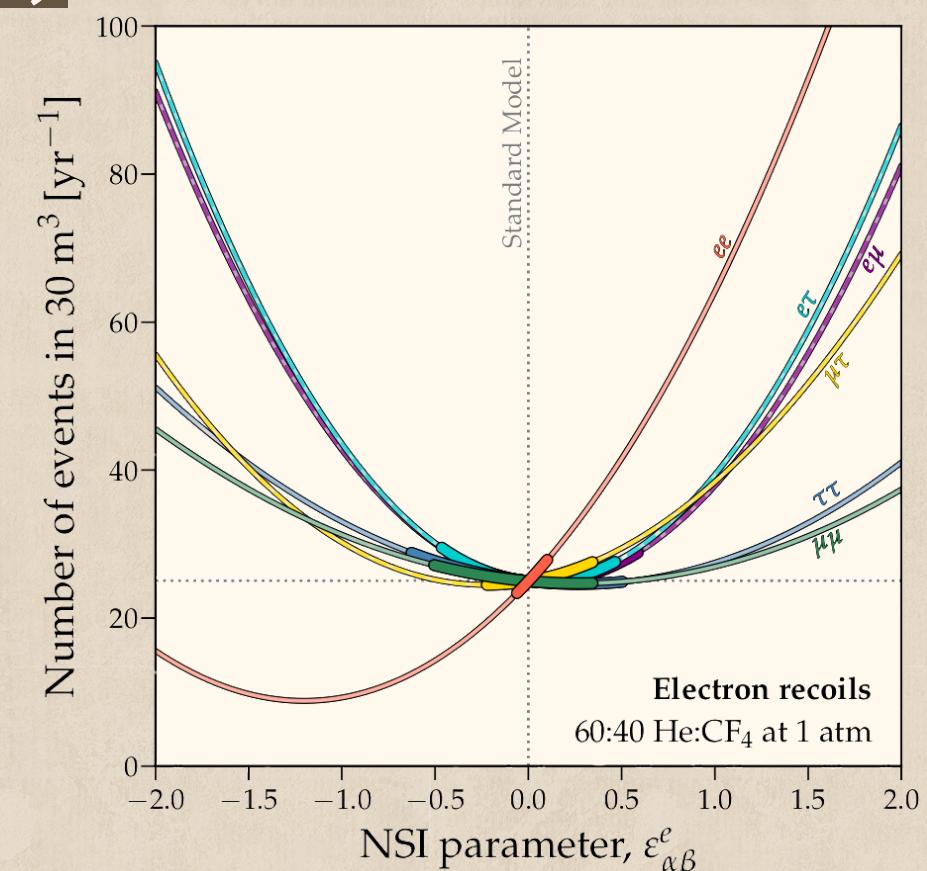
...to Non-Standard Interactions (NSIs)



modifies both neutrino **scattering** and **propagation!**

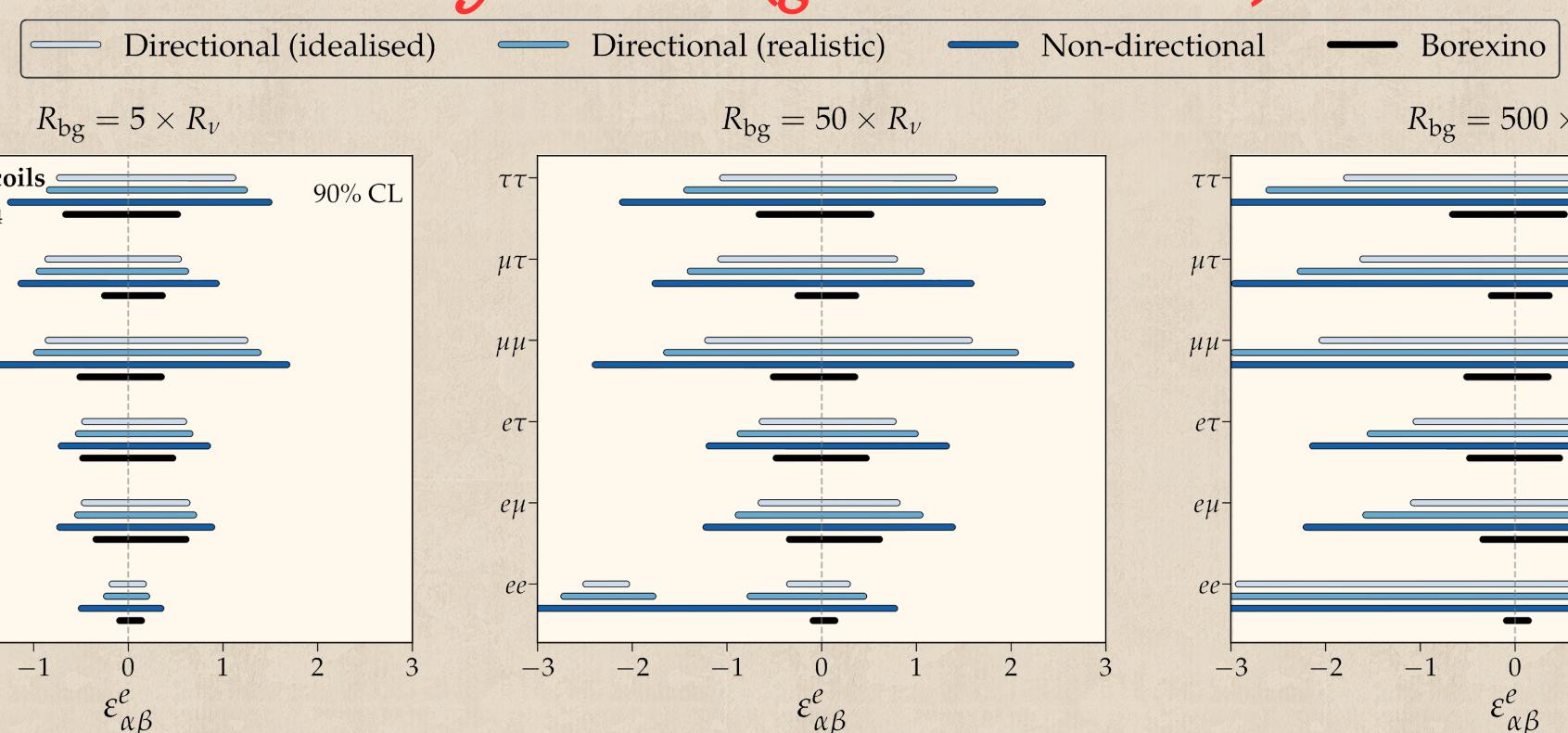
cross-section and **oscillation probability** are changed

Let's look at the effects of varying these parameters!



Results

Heavy mediator (generic NSI model)



Conclusions

Studying **low-energy neutrino-electron recoils** is challenging for both large higher-threshold experiments like Borexino and low-threshold – but high-background – dark matter ones. MPGDs are well motivated as a **lower cost and size** option: their **low-threshold** and **high signal-to-noise** reconstruction of ionisation tracks allows them to **constrain new physics** at sensitivities close to Borexino's, as well as **claim a discovery**.